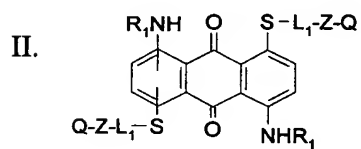
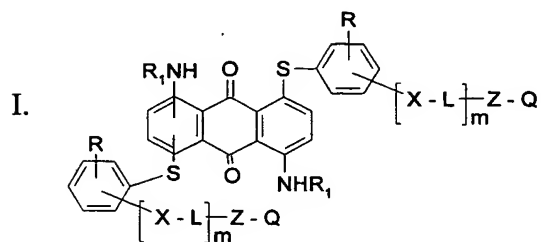


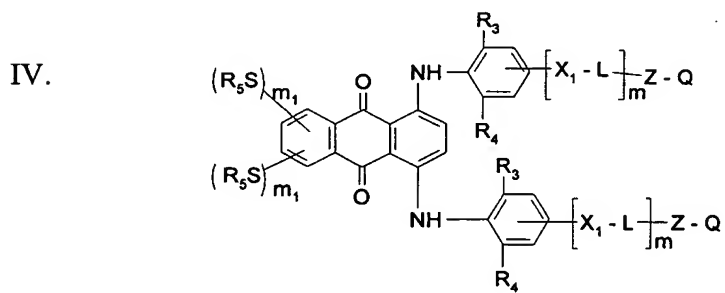
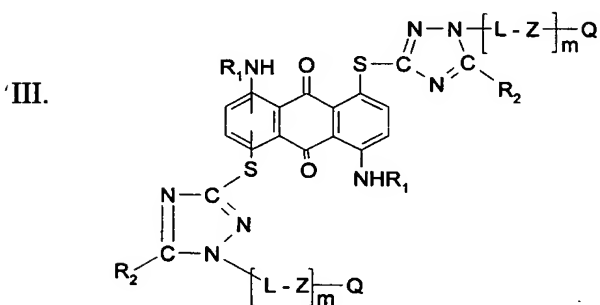
CLAIMS

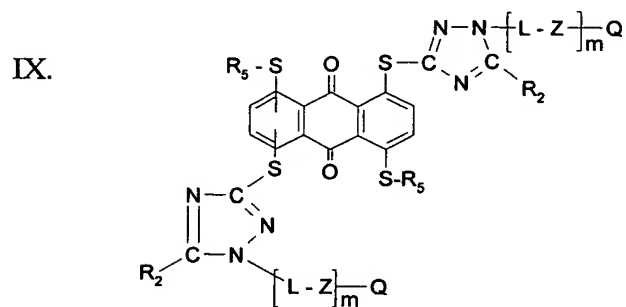
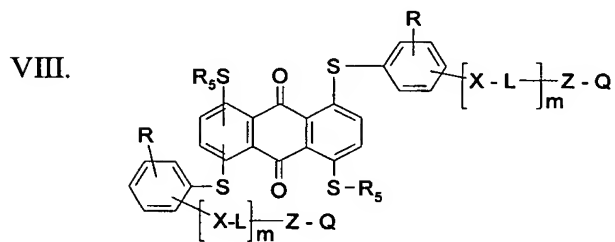
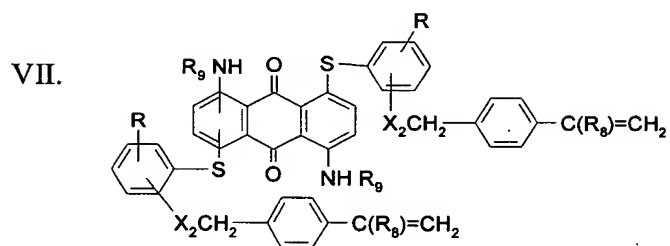
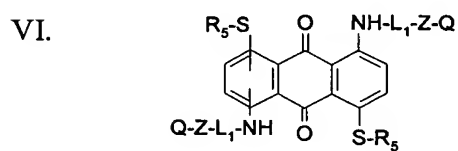
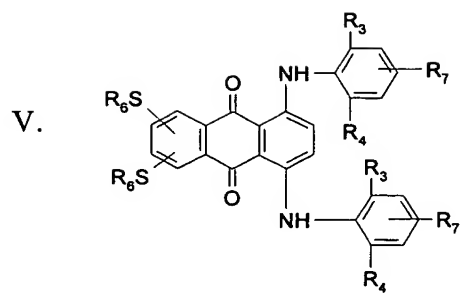
We claim:

1. Anthraquinone dye compounds having the formulae:

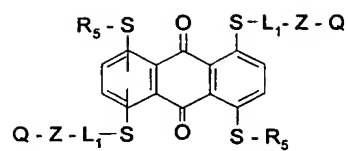


5

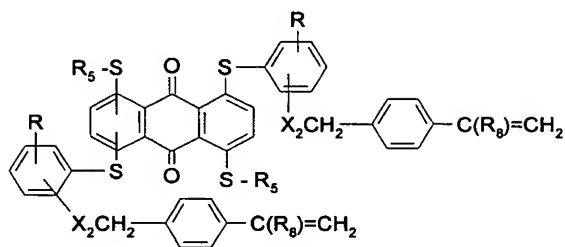




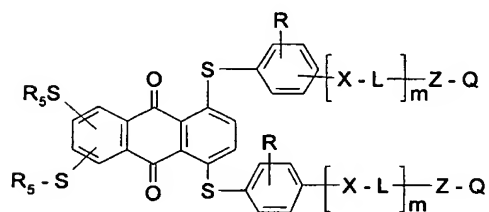
X.



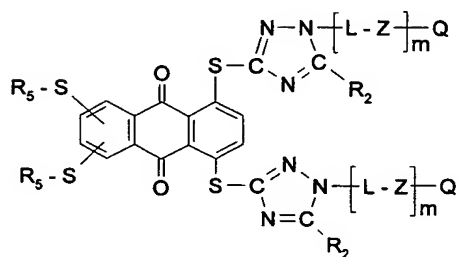
XI.



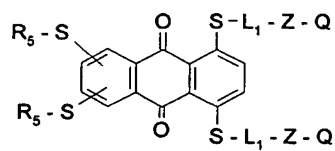
XII.



XIII.

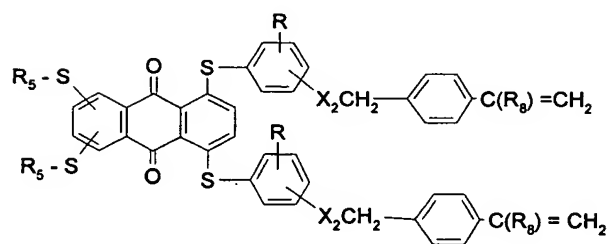


XIV.

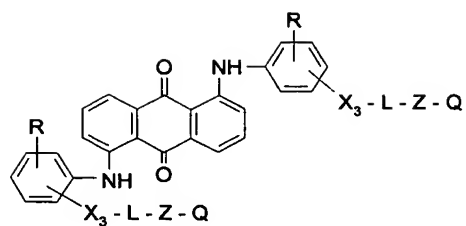


5

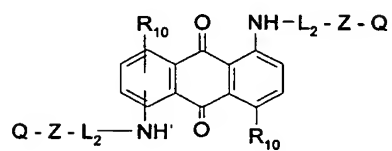
XV.



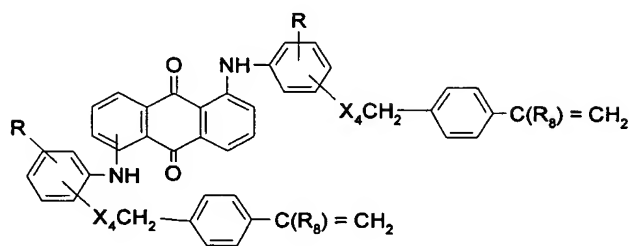
XVI.



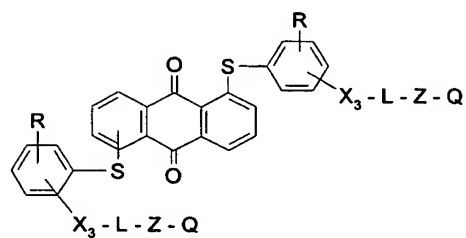
XVII.



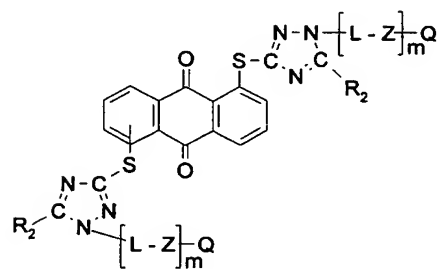
XVIII.



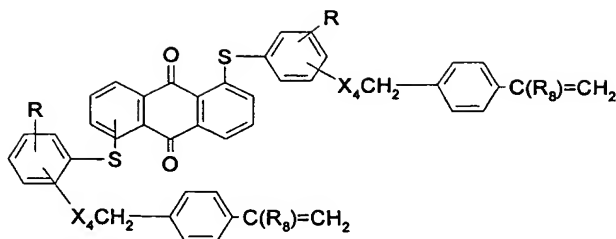
XIX.



XX.



XXI.



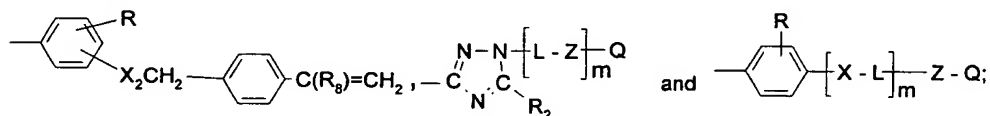
wherein:

R is selected from hydrogen or 1-3 groups selected from C₁ - C₆-alkyl, C₁ - C₆-alkoxy and halogen;

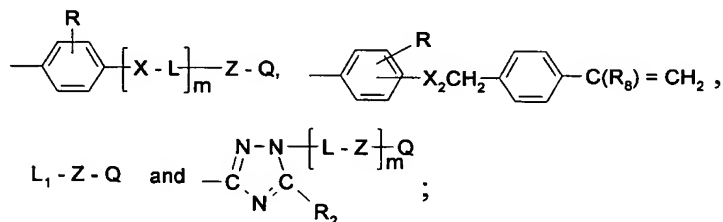
5 R₁ is selected from C₁ - C₆-alkyl, substituted C₁ - C₆-alkyl, C₃ - C₈-alkenyl, C₃ - C₈-cycloalkyl, aryl and -L₁-Z-Q; R₂ = selected from hydrogen, C₁ - C₆-alkyl, substituted C₁ - C₆-alkyl, C₃ - C₈-cycloalkyl and aryl;

R₃ and R₄ are independently selected from C₁ - C₆-alkyl and bromine;

10 R₅ is selected from C₁ - C₆-alkyl, substituted C₁ - C₆ alkyl, C₃ - C₈-cycloalkyl, aryl, heteroaryl, -L₁-Z-Q,



R₆ is selected from



15 R₇ is selected from hydrogen, substituted or unsubstituted C₁ - C₆-alkyl, C₁ - C₆-alkoxy, halogen, hydroxy, substituted or unsubstituted C₁ - C₆-alkylthio, sulfamoyl and substituted sulfamoyl;

R₈ is selected from hydrogen and C₁ - C₆-alkyl;

R₉ is selected from the groups represented by R₁ and -L - Z - Q;

R₁₀ is selected from hydrogen and halogen;

X is a covalent bond or a divalent linking group selected from -O-, -S-, -SO₂-, -CO₂-, -CON(Y)- and -SO₂N(Y)-, wherein Y is selected from hydrogen, C₁-C₆-alkyl, substituted C₁-C₆-alkyl, C₃-C₈-cycloalkyl, C₃-C₈-alkenyl, aryl and -L-Z- Q;

X₁ is selected from -O-, -S-, -SO₂- and -SO₂N(Y)-;

X₂ is selected from -CO₂- and -SO₂N(Y₁), wherein Y₁ is a group selected from hydrogen, C₁-C₆-alkyl, substituted C₁-C₆-alkyl, C₃-C₈-alkenyl, C₃-C₈-cycloalkyl, aryl, heteroaryl and -CH₂-p-C₆H₄-C(R₈)=CH₂;

X₃ is selected from -CO₂-, -SO₂N(Y)-;

X₄ is selected from -CO₂-, -O- and -SO₂N(Y₁)-;

L is a divalent linking group selected from C₁-C₈-alkylene, C₁-C₆-alkylene-arylene, arylene, C₁-C₆-alkylene-arylene -C₁-C₆-alkylene, C₃-C₈-cycloalkylene, C₁-C₆-alkylene -C₃-C₈-cycloalkylene -C₁-C₆-alkylene, C₁-C₆-alkylene - Z₁-arylene -Z₁-C₁-C₆-alkylene and C₂-C₆-alkylene-[-Z₁-C₂-C₆-alkylene-]_n- wherein Z₁ is selected from -O-, -S- and -SO₂- and n is 1-3;

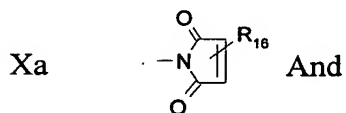
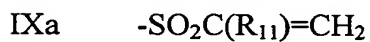
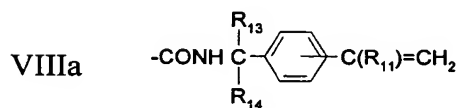
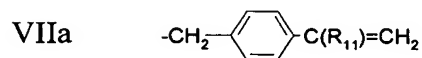
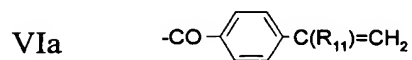
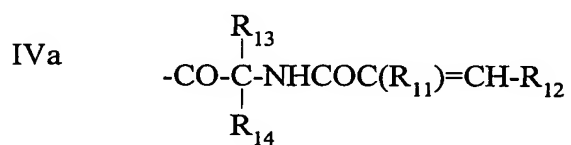
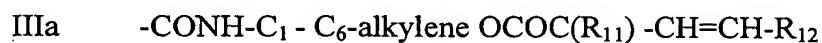
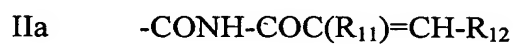
L₁ is a divalent linking group selected from C₂-C₆-alkylene, C₁-C₆-alkylene-C₃-C₈-cycloalkylene-C₁-C₆-alkylene, C₁-C₆-alkylene-arylene, C₃-C₈-cycloalkylene, and C₂-C₆-alkylene-[-Z₁-C₂-C₆-alkylene-]_n-;

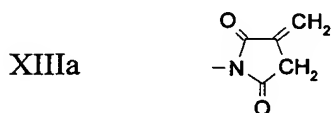
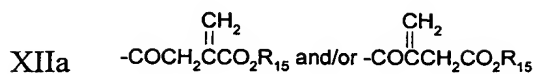
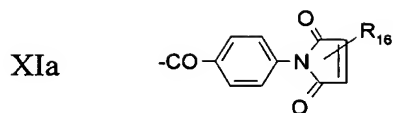
L₂ is selected from C₂-C₆-alkylene, C₁-C₆-alkylene-arylene-C₁-C₆-alkylene and C₁-C₆-alkylene-C₃-C₈-cycloalkylene-C₁-C₆-alkylene;

Z is a divalent group selected from -O-, -S-, -NH-, -N(C₁-C₆-alkyl)-, -N(C₃-C₈ alkenyl)-, -N(C₃-C₈ cycloalkyl)-, -N(aryl)-, -N(SO₂C₁-C₆-alkyl) and -N(SO₂ aryl)-, provided that when Q is a photopolymerizable optionally substituted maleimide radical, Z represents a covalent bond; Q is an ethylenically-unsaturated, photosensitive polymerizable group; and

m and m₁ each is 0 or 1.

2. Anthraquinone compounds according to Claim 1 wherein the ethylenically-unsaturated, photosensitive copolymerizable groups represented by Q are selected from the following organic radicals:





wherein:

R₁₁ is selected from hydrogen and C₁-C₆-alkyl;

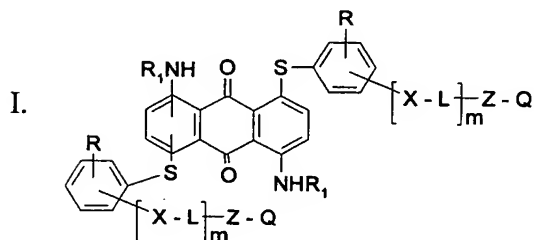
R₁₂ is selected from hydrogen; C₁-C₆-alkyl; phenyl and phenyl substituted with one or more groups selected from C₁-C₆-alkyl, C₁-C₆-alkoxy, -N(C₁-C₆-alkyl),
5 nitro, cyano, C₁-C₆-alkoxycarbonyl, C₁-C₆-alkanoyloxy and halogen; 1- and 2-naphthyl which may be substituted with C₁-C₆-alkyl or C₁-C₆-alkoxy; 2- and 3-thienyl which may be substituted with C₁-C₆-alkyl or halogen; 2- or 3-furyl which may be substituted with C₁-C₆-alkyl;

R₁₃ and R₁₄ are selected from hydrogen, C₁-C₆-alkyl, substituted C₁-C₆-
10 alkyl, aryl or may be combined to represent a -[CH₂]₃₋₅- radical;

R₁₅ is selected from hydrogen, C₁-C₆-alkyl, substituted C₁-C₆-alkyl, C₃-C₈-alkenyl, C₃-C₈-cycloalkyl and aryl;

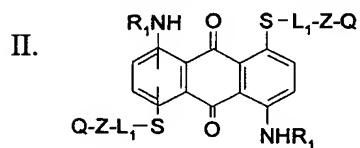
R₁₆ is selected from hydrogen, C₁ - C₆-alkyl and aryl.

15 3. Anthraquinone compounds according to Claim 2 having the formula:



wherein Z is -O-.

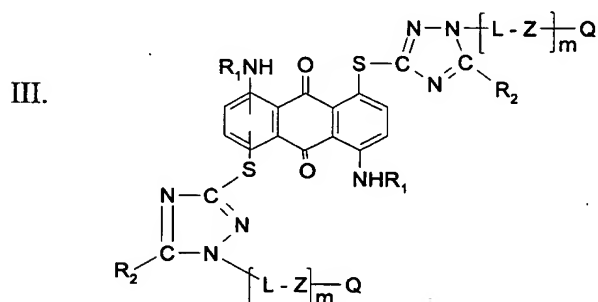
4. Anthraquinone compounds according to Claim 2 having the formula:



wherein Z is -O-.

5

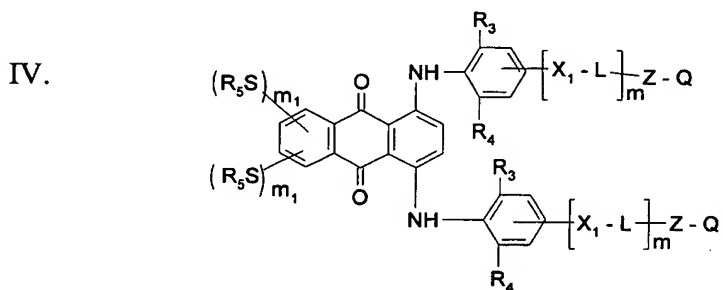
5. Anthraquinone compounds according to Claim 2 having the formula:



wherein Z is -O-.

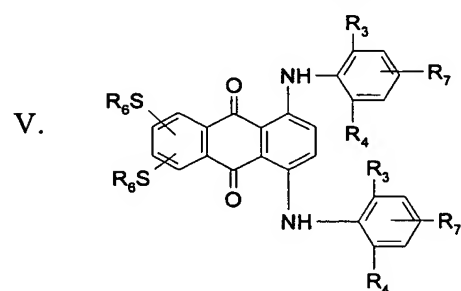
10

6. Anthraquinone compounds according to Claim 2 having the formula:



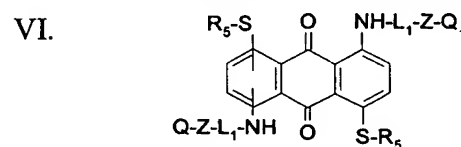
wherein Z is -O-.

7. Anthraquinone compounds according to Claim 2 having the formula:



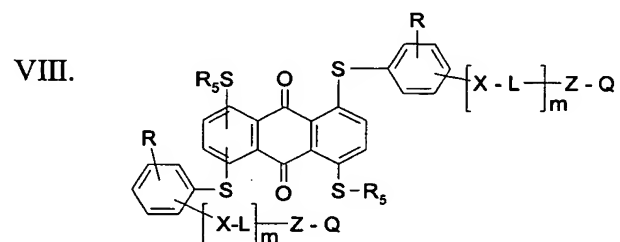
wherein Z is -O-.

- 5 8. Anthraquinone compounds according to Claim 2 having the formula:



wherein Z is -O-.

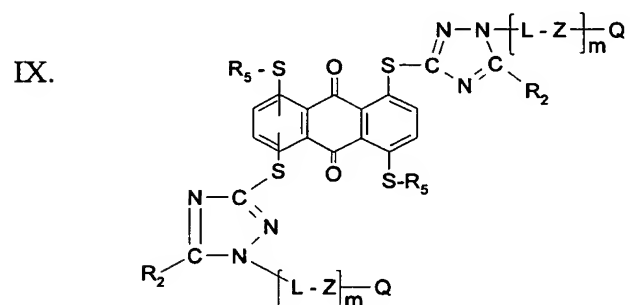
9. Anthraquinone compounds according to Claim 2 having the formula:



10

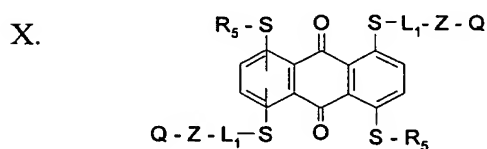
wherein Z is -O-.

10. Anthraquinone compounds according to Claim 2 having the formula:



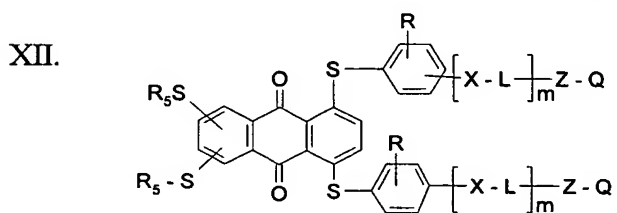
wherein Z is -O-.

5 11. Anthraquinone compounds according to Claim 2 having the formula:



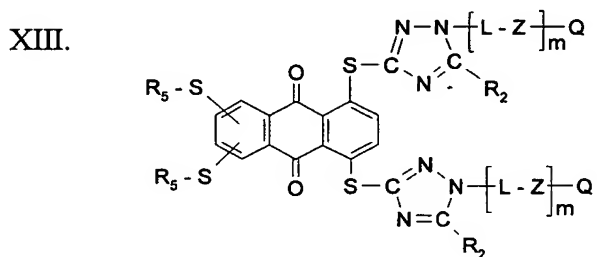
wherein Z is -O-.

12. Anthraquinone compounds according to Claim 2 having the formula:



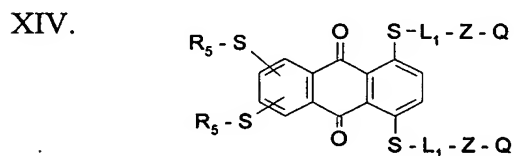
wherein Z is -O-.

13. Anthraquinone compounds according to Claim 2 having the formula:



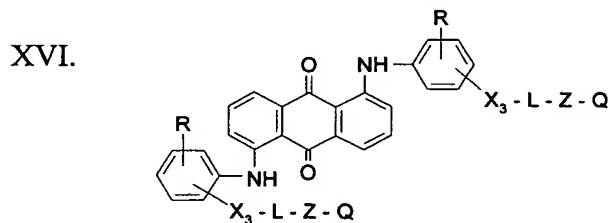
wherein Z is -O-.

5 14. Anthraquinone compounds according to Claim 2 having the formula:



wherein Z is -O-.

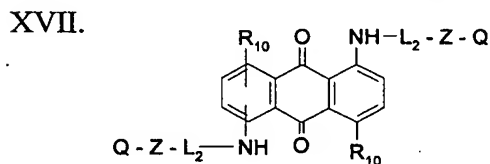
15. Anthraquinone compounds according to Claim 2 having the formula:



10

wherein Z is -O-.

16. Anthraquinone compounds according to Claim 2 having the formula:

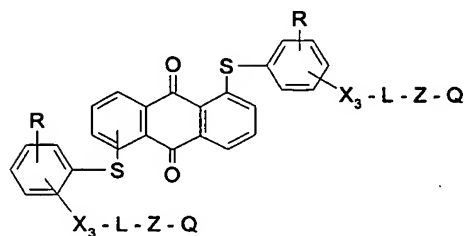


15

wherein Z is -O-.

17. Anthraquinone compounds according to Claim 2 having the formula:

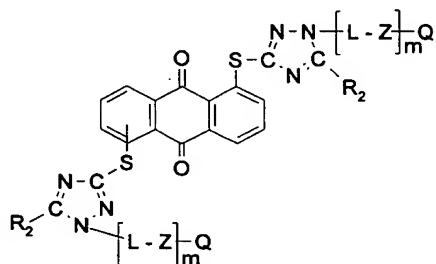
XIX.



wherein Z is $-O-$.

5 18. Anthraquinone compounds according to Claim 2 having the formula:

XX.



wherein Z is $-O-$.

10 19. Anthraquinone compounds according to Claim 2 wherein Q is organic radical Ia.

20. Anthraquinone compounds according to Claim 2 wherein Q is organic radical Ia wherein R_{11} is hydrogen or methyl and R_{12} is hydrogen.

15 21. Anthraquinone compounds according to Claim 2 wherein Q is organic radical VIIa.

22. Anthraquinone compounds according to Claim 2 wherein Q is organic radical VIIa wherein R_{11} is hydrogen.

23. Anthraquinone compounds according to Claim 2 wherein Q is organic radical VIIIa.
24. Anthraquinone compounds according to Claim 2 wherein Q is organic radical VIIIa wherein R_{11} is hydrogen or methyl and R_{13} and R_{14} are methyl. .
25. Anthraquinone compounds according to Claim 3 wherein X is $-\text{CO}_2-$, L is $-\text{CH}_2\text{CH}_2-$, and m is 1.
26. Anthraquinone compounds according to Claim 5 wherein L is $-\text{CH}_2\text{CH}_2-$, m is 1, and R_2 is hydrogen.
27. Anthraquinone compounds according to Claim 8 wherein L_1 is $-\text{CH}_2\text{C}(\text{CH}_3)_2\text{CH}_2-$ and R_5 is aryl.
28. Anthraquinone compounds according to Claim 9 wherein X is $-\text{CO}_2-$, L is $-\text{CH}_2\text{CH}_2-$, and m is 1.
29. Anthraquinone compounds according to Claim 10 wherein L is $-\text{CH}_2\text{CH}_2-$, R_2 is hydrogen and m is 1.
30. Anthraquinone compounds according to Claim 12 wherein X is $-\text{CO}_2-$, L is $-\text{CH}_2\text{CH}_2-$, and m is 1.
31. Anthraquinone compounds according to Claim 13 wherein L is $-\text{CH}_2\text{CH}_2-$, R_2 is hydrogen and m is 1.
32. Anthraquinone compounds according to Claim 15 wherein X_3 is $-\text{CO}_2-$, L is $-\text{CH}_2\text{CH}_2-$, and R is hydrogen or bromine.

33. Anthraquinone compounds according to Claim 15 wherein X_3 is $-\text{CO}_2-$, L is propylene, 1,4-cyclohexylenedimethylene or 2,2-dimethyltrimethylene, R is hydrogen, Z is $-\text{O}-$, and Q is an organic radical having the structure $-\text{COC}(\text{R}_{11})=\text{CH}_2$ wherein R_{11} is hydrogen, methyl or ethyl.

5

34. Anthraquinone compounds according to Claim 15 wherein X_3 is $-\text{CO}_2-$, L is propylene, 1,4-cyclohexylenedimethylene or 2,2-dimethyltrimethylene, R is hydrogen, Z is $-\text{O}-$, and Q is an organic radical having structure VIIIa wherein R_{11} , R_{13} and R_{14} each is methyl.

10

35. Anthraquinone compounds according to Claim 16 wherein L_2 is $-\text{CH}_2\text{C}(\text{CH}_3)_2\text{CH}_2-$, and R_{10} is hydrogen.

15

36. Anthraquinone compounds according to Claim 17 wherein X_3 is $-\text{CO}_2-$, L is $-\text{CH}_2\text{CH}_2-$, and R is hydrogen.

20

37. Anthraquinone compounds according to Claim 17 wherein X_3 is $-\text{CO}_2-$, L is propylene, 1,4-cyclohexylenedimethylene or 2,2-dimethyltrimethylene, R is hydrogen, Z is $-\text{O}-$, and Q is an organic radical having the structure $-\text{COC}(\text{R}_{11})=\text{CH}_2$ wherein R_{11} is hydrogen, methyl or ethyl.

25

38. Anthraquinone compounds according to Claim 17 wherein X_3 is $-\text{CO}_2-$, L is propylene, 1,4-cyclohexylenedimethylene or 2,2-dimethyltrimethylene, R is hydrogen, Z is $-\text{O}-$, and Q is an organic radical having structure VIIIa wherein R_{11} , R_{13} and R_{14} each is methyl.

39. Anthraquinone compounds according to Claim 18 wherein L is $-\text{CH}_2\text{CH}_2-$, R_2 is hydrogen, and m is 1.

40. Anthraquinone compounds according to Claim 6 wherein X is $-\text{SO}_2\text{N}(\text{Y})-$, L is $\text{C}_2\text{-C}_6$ alkylene, R_3 and R_4 are methyl or ethyl, Y is hydrogen, m is 1 and m_1 is 0.
- 5 41. Anthraquinone compounds according to Claim 6 wherein X is $-\text{SO}_2\text{N}(\text{Y})-$, L is $\text{C}_2\text{-C}_6$ alkylene, R_3 and R_4 are methyl or ethyl, Y is hydrogen, m is 1 and m_1 is 1.
- 10 42. Anthraquinone compounds according to Claim 1 having formula VII wherein X_2 is $-\text{CO}_2-$ and R and R_8 are hydrogen.
43. Anthraquinone compounds according to Claim 1 having formula XI wherein X_2 is $-\text{CO}_2-$ and R_1 and R_8 are hydrogen.
- 15 44. Anthraquinone compounds according to Claim 1 having formula XVII wherein X_4 is $-\text{CO}_2-$ and R and R_8 are hydrogen.
- 20 45. Anthraquinone compounds according to Claim 1 having formula XXI wherein X_4 is $-\text{CO}_2-$ and R and R_8 are hydrogen.
46. Anthraquinone compounds according to Claim 1 having formula IV wherein X_1 is $-\text{O}-$, Z is $-\text{O}-$, L is $-\text{CH}_2\text{CH}_2-$, R_3 and R_4 are methyl or ethyl, m is 1 and m_1 is 0.
- 25 47. A coating composition comprising (i) one or more polymerizable vinyl compounds, (ii) one or more of the dye compounds of Claim 1, and (iii) a photoinitiator.
- 30 48. A coating composition according to Claim 47 comprising (i) one or more polymerizable vinyl compounds, (ii) one or more of the dye compounds of Claim 2

present in a concentration of about 0.05 to 15 weight percent based on the weight of component (i), and (iii) a photoinitiator present in a concentration of about 1 to 15 weight percent based on the weight of the polymerizable vinyl compound(s) present in the coating composition.

5

49. A coating composition according to Claim 48 wherein the polymerizable vinyl compounds comprise a solution of a polymeric, polymerizable vinyl compound selected from acrylated and methacrylated polyesters, acrylated and methacrylated polyethers, acrylated and methacrylated epoxy polymers, acrylated or methacrylated urethanes, and mixtures thereof, in a diluent selected from monomeric acrylate and methacrylate esters.

10

50. A polymeric coating composition comprising a polymer of one or more acrylic acid esters, one or more methacrylic acid esters and/or other copolymerizable vinyl compounds, having copolymerized therein one or more of the dye compounds defined in Claim 1.

15

51. A polymeric composition according to Claim 50 comprising a coating of an acrylic polymer of one or more acrylic acid esters, one or more methacrylic acid esters or a mixture thereof having copolymerized therein one or more of the dye compounds defined in Claim 2.

20

52. A polymeric composition according to Claim 50 comprising a coating of an unsaturated polyester containing one or more maleate/fumarate residues; one or more monomers which contain one or more vinyl ether groups, one or more vinyl ester groups, or a combination thereof, and, optionally, one or more acrylic or methacrylic acid esters; or a mixture thereof having copolymerized therein one or more of the dye compounds defined in Claim 2.

25

53. A polymeric coating according to Claim 51 containing from about 0.05 to 15.0 weight percent of the residue of one or more of the dye compounds of Claim 2 based on the weight of the coating.